HD20
Heavy Duty Incremental Encoder

Features
- Incremental encoder with 2” outer diameter
- Heavy-duty shaft and bearings
- Quadrature output with reference marker
- IP65 protection
- 5 V Line Driver output
- 5 V or 12 V Open Collector output
- 8 V to 24 V Line Driver output
- 10 to 2500 pulses per revolution
**HD20**

**Technical Data/Features**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pulses per revolution (Z)</td>
<td>10, 20, 30, 50, 60, 100, 128, 150, 180, 200, 240, 250, 256, 300, 336, 360, 400, 500, 512, 600, 720, 800, 900, 960, 1000, 1024, 1140, 1152, 1200, 1230, 1250, 1260, 1270, 1386, 1500, 1512, 1800, 1888, 2000, 2048, 2400, 2500</td>
</tr>
<tr>
<td>Interfaces</td>
<td>RS-422 (3487 Line driver) Open collector (7406) 8-24 V Line driver (7272)</td>
</tr>
<tr>
<td>Dimensions</td>
<td>See drawing</td>
</tr>
<tr>
<td>Mass</td>
<td>8 oz (0.23 kg)</td>
</tr>
<tr>
<td>Moment of inertia of rotor</td>
<td>$2.4 \times 10^{-4}$ oz-in-sec$^2$ (16.9 gcm$^2$)</td>
</tr>
<tr>
<td>Measurement step</td>
<td>90/Z$^\circ$</td>
</tr>
<tr>
<td>Reference (marker) signal</td>
<td>Number: 1 Position: Non-gated 180°±90° electrical Gated 180° nominal (gated w/count channel B)</td>
</tr>
<tr>
<td>Error limits</td>
<td>45/Z$^\circ$</td>
</tr>
<tr>
<td>Measurement step deviation</td>
<td>45/Z$^\circ$</td>
</tr>
<tr>
<td>Max output frequency</td>
<td>100 kHz</td>
</tr>
<tr>
<td>Max operating speed</td>
<td>3000 rpm at max shaft loading 5000 rpm at reduced shaft loading</td>
</tr>
<tr>
<td>Max angular acceleration</td>
<td>50,000 radians/sec$^2$</td>
</tr>
<tr>
<td>Max starting torque</td>
<td>without shaft seal 1.5 oz-in</td>
</tr>
<tr>
<td></td>
<td>with shaft seal 5.0 oz-in (10.5 Ncm)</td>
</tr>
<tr>
<td></td>
<td>(35.0 Ncm)</td>
</tr>
<tr>
<td>Permissible shaft loading</td>
<td>Radial (at end of shaft) 35 lb (155 N)</td>
</tr>
<tr>
<td></td>
<td>Axial 40 lb (178 N)</td>
</tr>
<tr>
<td>*Service life of bearings</td>
<td>$5.0 \times 10^9$ revolutions</td>
</tr>
<tr>
<td>Working temp. range</td>
<td>0....+70 °C</td>
</tr>
<tr>
<td>Storage temp. range</td>
<td>-20....+85 °C</td>
</tr>
<tr>
<td>Permissible relative humidity</td>
<td>95 % (condensation not permitted)</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>50Gs for 11 ms</td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>5 to 2,000 Hz at 20 Gs</td>
</tr>
<tr>
<td>Protection Class</td>
<td>IP65</td>
</tr>
<tr>
<td>Working voltage range</td>
<td>4.75 to 5.25 V 11.4 to 12.6 V 8.0 to 24.0 V</td>
</tr>
<tr>
<td>Working current at no load</td>
<td>120 mA</td>
</tr>
<tr>
<td>Optional signal cable</td>
<td>(power supply and drain wire are isolated from housing)—Diameter 0.19 in (5 mm)</td>
</tr>
</tbody>
</table>

*B10 Life with shaft loading of 10 lb axial and 10 lb radial (end of shaft)*
**HD20**

**Dimensions in. (mm)**

Mounting Options

- **Servo Mount (S)**
  - 2.50 (63.5) Sq
  - 0.12 (3.05)
  - 2.06 (52.3) dia
- **2.5” square flange (T)**
  - 0.20 (5.08) thru-(4) holes
  - 0.25 (6.35)
  - 0.75 (19.1)
- **2.5” Servo Mount (K)**
  - 0.100 (2.54)
  - 0.105 (2.67)
  - 1.249 (31.72)
  - 1.247 (31.67)
- **Face Mount with Pilot (P)**
  - 1.00 (25.4)
  - 0.37 (9.4)
  - 2.00 (50.8) dia

Shaft Options

- **0.25” (-2)**
  - 0.2497 (6.342) dia.
  - 0.2495 (6.337)
- **10mm (-3)**
  - 0.3931 (9.984) dia.
  - 0.3927 (9.974)
  - 0.586 (14.86)
- **0.375” w/flat (-4)**
  - 0.343 (8.712) Flat
  - 0.3744 (9.510)
  - 0.374 (9.510) dia.
- **Ext. 0.375” w/flat (-5)**
  - 0.343 (8.712) Flat
  - 0.3746 (9.515)
  - 0.3744 (9.510) dia.
HD20

How to Order
Shaded features available from stock. Construct a model number per the example below:

Example for ordering

HD20 [DM] - [1000-5] [LD] - [S10B-1]

Output channels
DM: Dual channel with marker
DG: Dual channel with gated marker

Pulses per revolution
Select from table

Supply voltage/output configuration
5LD: 5VDC line driver
8/24LD: 8 to 24VDC line driver
50C: 5VDC open collector (no pullups)
120C: 12VDC open collector (no pullups)

Mounting
F: Flange, 2” square
S: Servo, 2” dia.
T: Flange, 2.5” square
K: Servo, 2.5” dia.
P: Face Mount

Connector type
6: MS3102R-14S-6P (6 pin)
10: MS3102R-18-1P (Required with line driver, 10 pin)
C: 8 cond. shield cable, 18” long

Connector position
S: Side
B: Back (Not available with 8/24 LD)

Shaft designation
1: 3/8” dia., standard
2: 1/4” dia.
3: 10mm dia., (6/4321)
4: 3/8” dia., with flat
5: Extended 3/8” dia., with flat

Optional features
A: Shaft seal - standard
Blank: None

Order mating connectors separately
Pin # Mating Connector
6 MS3106F-14S-6S
10 MS3106F-18-1S

Electrical Connections

<table>
<thead>
<tr>
<th>Function</th>
<th>6 pin Connector</th>
<th>10 pin Connector</th>
<th>Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common</td>
<td>A</td>
<td>F</td>
<td>Black</td>
</tr>
<tr>
<td>+Vs</td>
<td>B</td>
<td>D</td>
<td>Red</td>
</tr>
<tr>
<td>M output</td>
<td>C</td>
<td>C</td>
<td>White/Black</td>
</tr>
<tr>
<td>A output</td>
<td>E</td>
<td>A</td>
<td>White</td>
</tr>
<tr>
<td>B output</td>
<td>D</td>
<td>B</td>
<td>Green</td>
</tr>
<tr>
<td>Case Ground</td>
<td>F</td>
<td>G</td>
<td>N/A</td>
</tr>
<tr>
<td>Á output</td>
<td>N/A</td>
<td>H</td>
<td>Blue</td>
</tr>
<tr>
<td>B output</td>
<td>N/A</td>
<td>I</td>
<td>Orange</td>
</tr>
<tr>
<td>M output</td>
<td>N/A</td>
<td>J</td>
<td>Red/Black</td>
</tr>
<tr>
<td>Shield</td>
<td>-</td>
<td>-</td>
<td>Drain wire</td>
</tr>
</tbody>
</table>

Output Waveforms

Notes
1. **Channel B** leads **Channel A** for clockwise rotation when viewed from shaft end.
2. Marker pulse is approximately centered on negative going **Channel A**.
3. Complementary signals (Á, B, and M) are standard only with line drivers. Ten pin connector is required.

Shaded areas represent the locus of leading and trailing edges of marker pulse.